

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Municipal contraceptive services, socioeconomic status, and teenage pregnancy in Finland – a longitudinal study
AUTHORS	Jalanko, Eerika; Gyllenberg, Frida; Krstic, Nikolas; Gissler, Mika; Heikinheimo, Oskari

VERSION 1 – REVIEW

REVIEWER	Kai Part Department of Obstetrics and Gynaecology, University of Tartu, Estonia
REVIEW RETURNED	23-Aug-2020

GENERAL COMMENTS	<p>General assessment</p> <p>This manuscript is on important topic - teenage pregnancies and factors associated with social environment - and well written. The outcomes are of importance to policy development in Finland and other countries considering introducing free-of-charge contraceptives for young people.</p> <p>There is a large dataset covering a considerable period of time and register-based data which is a strength of this study. There are some minor revisions to be made, but I recommend this manuscript for publication.</p> <p>The title and abstract - please consider clarifying the term "socioeconomic status" so that the reader will understand from the beginning that you are not aiming individual SE status that is frequently addressed in scientific literature but rather regional or municipal SE profile. Please follow this principle throughout the manuscript. Similarly, please make it more clear that you have addressed educational level in the region, not individual educational level (abstract row 33 and throughout the manuscript).</p> <p>Introduction</p> <p>Row 33, please consider using the term "sexuality education" (as used by WHO European Standards for sexuality education, and also other international organisations like UNESCO etc) when you are referring to providing information and counseling on contraception as part of school curricula. There is enough evidence by now that the use of effective contraceptive methods is associated with school-based sexuality education and also visiting (youth-friendly) contraceptive services. Consider searching and adding more references here.</p> <p>In the introduction, please explain in more detail why you have chosen to investigate socioeconomic status, in addition to available contraceptive services, as a factor related to teenage pregnancies? Give your hypothesis here and let the reader understand why this is important to investigate.</p> <p>Methods - the study design, outcomes and explanatory variables are clearly presented. Table 1 - the title is not reflecting the</p>
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	<p>content precisely, as you are describing the explanatory variables (not study municipalities) by four areas in Finland. It seems that the sentence is not correct in ** footnotes ("Data are in numbers ..."). It is also not clear what are the numbers in brackets in four last lines of the table. Page 8, rows 40-45 - there is no need to duplicate the data as you have given the same data in the table already. Statistical methods - as a reviewer I am not fully competent to assess the statistical methods used in this manuscript, but I can see that the methods are presented in detail. Results and discussion - you have well showed the declining trends of teenage pregnancies in Figure 1 which shows that the already low teenage birth and abortion rates in 2000 have further declined in following nearly 20 years. This raises important question - which factors have contributed to this further decline? Be more confident to give possible explanations in the discussion and conclusion, relying on your results. Adolescent clinics were not associated with lower teenage pregnancy rates - give possible explanation to this also. Although in the title you have addressed SE status you haven't discussed the results concerning SE status, please consider adding a comment to the discussion. Page 14, you have used abbreviation SARC - which is partly self-explanatory here. However, please give the meaning first and then use the abbreviation. P 15 r 5 you have suggested that access to contraceptive services may contribute to lower abortion rates seen in other regions than Helsinki. Please specify your hypothesis here (maybe you mean longer distances here?) and if available, add also references. Similarly, if you mention attitudes towards induced abortion, then specify what do you mean - less favourable attitudes maybe? Page 16, in the conclusion, be more confident to recommend continuing provision of free-of-charge contraception, in order to continuously reduce teenage pregnancies, as your results indicate that this contraceptive service measure has most likely contributed to the decline of teenage pregnancies seen since 2000 (see also the recommendation previously).</p>
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REVIEWER	<p>Dr. Brigitte Dahmen Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy University Hospital RWTH Aachen Neuenhofer Weg 21 52074 Aachen Germany</p>
REVIEW RETURNED	08-Sep-2020

GENERAL COMMENTS	<p>Review bmjopen-2020-043092</p> <p>This study aimed to investigate the combined association of contraceptive services and socioeconomic risk factors such as education level and need for social assistance with teenage childbirth and induced abortion rates for the different municipalities in Finland.</p> <p>It is a retrospective longitudinal register study covering adolescent childbirth and abortion rates per 1000 teenage girls (between 15 and 19 years of age) in the 100 largest municipalities in Finland, which were subsumed into 5 major regions, using data from 2000 to 2018.</p> <p>Providing free-of-charge contraception, availability of over-the-counter emergency medication, and higher education level were</p>
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	<p>all significantly associated with lower teenage childbirth and reduced abortion rates when controlling for all other variables.</p> <p>These services seem to prevent teenage pregnancy in young females in Finland and its extension could be a starting point to reduce teenage pregnancy rates even further.</p> <p>The approach seems promising, and the study extends previous findings by examining possible regional and socioeconomic factors and service availability on the rate of teenage childbirth. Nonetheless, the variables are only assessed on the population level, which impedes strong conclusions for the individual.</p> <p>I suggest taking into account the following questions/issues which might help strengthen the manuscript:</p> <p>Major points:</p> <ol style="list-style-type: none"> 1. Regarding the research question, introduction section: The authors provide a brief overview on the disadvantageous effects of pregnancy and childbearing in adolescence. They also stress the possible effect of available and adequate contraception on decreasing teenage pregnancies. But in their research question the authors state that they intend to investigate the “combined effects of both socioeconomic status and contraceptive services on teenage pregnancy rates” which “are lacking” (p. 5, ll. 55-58) without having given a thorough background on socioeconomic status and teenage pregnancy. Also, they should mention the possible benefits/rationale of combining these psychosocial factors. Given that there is already a rich literature on the topic, the authors might provide more background on why filling this gap is important. They should also, in the discussion section, integrate their study findings more comprehensively into the current state of knowledge. 2. Regarding the study population: Could the authors elaborate a bit more on why they only took into account pregnancies or induced abortions in youths between the ages of 15 and 19 years and provide a reference? 3. Regarding table 1: In Table 1, if I understood correctly, the socioeconomic factors seem to be portrayed dichotomously (e.g. percentage of inhabitants having a high education level), although in the method section, it is reported that the data were treated as continuous variables in the calculations. It might be more comprehensible for the reader that the authors also provide the means of the continuous data in table 1. 4. Regarding the limitations: The longitudinal retrospective register design of the study seems very comprehensive, but data on socioeconomic status per municipality do not indicate the socioeconomic status of the individual. The authors might state this also as a limitation. 5. Regarding the discussion: The rate of teenage pregnancy and induced abortions declines steeply in all 5 regions in Finland. Have the authors considered to employ some structural equation or path models to investigate, whether an increase in counseling or free-of-charge contraception or an amelioration of education level is associated with a later decrease? Additionally, it might be interesting for the reader to elaborate a bit more on the possible
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	<p>reasons for this decrease, e.g., unconsidered factors.</p> <p>Minor points:</p> <ol style="list-style-type: none"> 1. Discussion section, p. 15 of 21, l. 47: A “the” seems to be missing before “majority of the adolescent pregnancies...”. 2. Discussion section, p. 15 of 21, l. 40: A “the” seems to be missing before “100 largest municipalities in Finland...”. 3. Discussion section, p. 15 of 21, l. 51: An “as” seems to be missing before “unplanned or ambitious.”.
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: Kai Part

Institution and Country: Department of Obstetrics and Gynaecology, University of Tartu, Estonia

Please state any competing interests or state ‘None declared’: None declared

Comments to the Author

General assessment

This manuscript is on important topic - teenage pregnancies and factors associated with social environment - and well written. The outcomes are of importance to policy development in Finland and other countries considering introducing free-of-charge contraceptives for young people.

There is a large dataset covering a considerable period of time and register-based data which is a strength of this study. There are some minor revisions to be made, but I recommend this manuscript for publication.

* The title and abstract - please consider clarifying the term "socioeconomic status" so that the reader will understand from the beginning that you are not aiming individual SE status that is frequently addressed in scientific literature but rather regional or municipal SE profile. Please follow this principle throughout the manuscript. Similarly, please make it more clear that you have addressed educational level in the region, not individual educational level (abstract row 33 and throughout the manuscript).

R: Thank you for pointing this out. We have now clarified that the socioeconomic status refers to the municipal SE status instead of individual SE status.

Introduction

* Row 33, please consider using the term "sexuality education" (as used by WHO European Standards for sexuality education, and also other international organisations like UNESCO etc) when you are referring to providing information and counseling on contraception as part of school curricula. There is enough evidence by now that the use of effective contraceptive methods is associated with school-based sexuality education and also visiting (youth-friendly) contraceptive services. Consider searching and adding more references here.

R: We added the term “sexuality education” and two more references of the effect of sexuality education on adolescent contraceptive use (Kirby et al 2007, Green et al 2017) (p. 4, first paragraph).

* In the introduction, please explain in more detail why you have chosen to investigate socioeconomic status, in addition to available contraceptive services, as a factor related to teenage pregnancies? Give your hypothesis here and let the reader understand why this is important to investigate.

R: Thank you for this constructive comment. Teenage pregnancy associates with socioeconomic and educational disadvantages, as we have mentioned at the beginning of the introduction section. To clarify the importance of investigating both socioeconomic status and contraceptive services we have added the findings of Maslowsky et al. 2019 from the U.S. showing that especially teen births cluster in counties with lower socioeconomic conditions (Introduction section p. 3, first paragraph). We have also highlighted this at the end of the Introduction section (p. 4, first paragraph).

Methods - the study design, outcomes and explanatory variables are clearly presented.

*Table 1 - the title is not reflecting the content precisely, as you are describing the explanatory variables (not study municipalities) by four areas in Finland. It seems that the sentence is not correct in ** footnotes ("Data are in numbers ..."). It is also not clear what are the numbers in brackets in four last lines of the table.

R: Thank you for pointing this out. We have clarified the Table 1 to describe only the explanatory variables in the study municipalities aggregated into four major regions. The numbers in the brackets refer to the measurement points when the service was available in the municipalities across the follow-up, where we take into account the number of the municipalities offering the service and how many years the service has been available in the municipality. We have clarified this at the beginning of the Methods section (p. 4, first paragraph), and now also in the footnotes of the Table 1.

*Page 8, rows 40-45 - there is no need to duplicate the data as you have given the same data in the table already.

R: Thank you! We have now removed the data from the Table 1 and explained it only in the text (please see also the comment above).

Statistical methods - as a reviewer I am not fully competent to assess the statistical methods used in this manuscript, but I can see that the methods are presented in detail.

Results and discussion - you have well showed the declining trends of teenage pregnancies in Figure 1 which shows that the already low teenage birth and abortion rates in 2000 have further declined in following nearly 20 years.

*This raises important question - which factors have contributed to this further decline? Be more confident to give possible explanations in the discussion and conclusion, relying on your results.

R: Thank you for this important comment! We have now highlighted more the importance of free-of-charge contraception and youth-friendly contraceptive services in order to decline teenage pregnancy rates (p. 15, first paragraph). We have also discussed a bit more some other factors not taken into account in our study setting that might also associate with the declining teenage pregnancy rates (p. 14, second paragraph), such as adolescent sexual behaviour and substance use.

*Adolescent clinics were not associated with lower teenage pregnancy rates - give possible explanation to this also.

R: There were only seven municipalities in our data that offered contraception services in a specific adolescent clinic, which may at least partly explain this. In addition, it might be that convenient location and flexible operating hours play a more remarkable role for teenagers seeking contraceptive services than a specialized adolescent clinic. We have added these aspects to revised Discussion (p. 13, first paragraph).

*Although in the title you have addressed SE status you haven't discussed the results concerning SE status, please consider adding a comment to the discussion.

R: Please see the last paragraph on p. 13 where we discuss the results concerning SE status.

*Page 14, you have used abbreviation SARC - which is partly self-explanatory here. However, please give the meaning first and then use the abbreviation.

R: Thank you for picking this up! We have now spelled out the meaning of SARC.

*P 15 r 5 you have suggested that access to contraceptive services may contribute to lower abortion rates seen in other regions than Helsinki. Please specify your hypothesis here (maybe you mean longer distances here?) and if available, add also references. Similarly, if you mention attitudes towards induced abortion, then specify what do you mean - less favourable attitudes maybe?

R: We have now clarified this a bit more in the text (p.13, second paragraph).

*Page 16, in the conclusion, be more confident to recommend continuing provision of free-of-charge contraception, in order to continuously reduce teenage pregnancies, as your results indicate that this contraceptive service measure has most likely contributed to the decline of teenage pregnancies seen since 2000 (see also the recommendation previously).

R: We have now recommended the provision of free-of-charge contraception as an important means to decline teenage pregnancy rates (p. 15, first paragraph).

Reviewer: 2

Reviewer Name: Dr. Brigitte Dahmen

Institution and Country:

Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy

University Hospital RWTH Aachen

Neuenhofer Weg 21

52074 Aachen

Germany

Please state any competing interests or state 'None declared': None declared

Comments to the Author

Review bmjopen-2020-043092

This study aimed to investigate the combined association of contraceptive services and socioeconomic risk factors such as education level and need for social assistance with teenage childbirth and induced abortion rates for the different municipalities in Finland.

It is a retrospective longitudinal register study covering adolescent childbirth and abortion rates per 1000 teenage girls (between 15 and 19 years of age) in the 100 largest municipalities in Finland, which were subsumed into 5 major regions, using data from 2000 to 2018.

Providing free-of-charge contraception, availability of over-the-counter emergency medication, and higher education level were all significantly associated with lower teenage childbirth and reduced abortion rates when controlling for all other variables.

These services seem to prevent teenage pregnancy in young females in Finland and its extension could be a starting point to reduce teenage pregnancy rates even further.

The approach seems promising, and the study extends previous findings by examining possible regional and socioeconomic factors and service availability on the rate of teenage childbirth. Nonetheless, the variables are only assessed on the population level, which impedes strong conclusions for the individual.

I suggest taking into account the following questions/issues which might help strengthen the manuscript:

Major points:

1. Regarding the research question, introduction section: The authors provide a brief overview on the disadvantageous effects of pregnancy and childbearing in adolescence. They also stress the possible effect of available and adequate contraception on decreasing teenage pregnancies. But in their research question the authors state that they intend to investigate the "combined effects of both socioeconomic status and contraceptive services on teenage pregnancy rates" which "are lacking" (p. 5, ll. 55-58) without having given a thorough background on socioeconomic status and teenage

pregnancy. Also, they should mention the possible benefits/rationale of combining these psychosocial factors. Given that there is already a rich literature on the topic, the authors might provide more background on why filling this gap is important. They should also, in the discussion section, integrate their study findings more comprehensively into the current state of knowledge.

R: Thank you for this constructive comment. Teenage pregnancy associates with socioeconomic and educational disadvantages, as we have mentioned at the beginning of the Introduction. To clarify the importance of investigating both socioeconomic status and contraceptive services we have added the findings of Maslowsky et al. 2019 from the U.S. that especially teen births cluster in counties with lower socioeconomic conditions (introduction section p. 3, first paragraph). We have also highlighted this at the end of the Introduction (p. 4, second paragraph). Please also see the last paragraph on p. 13 where we have discussed about our results concerning SE status and current knowledge about it.

2. Regarding the study population: Could the authors elaborate a bit more on why they only took into account pregnancies or induced abortions in youths between the ages of 15 and 19 years and provide a reference?

R: The incidence of teenage pregnancies is commonly indicated as n per 1000 15 to 19 year-old teenagers in literature. Hence, we took into account only the 15 to 19 year-olds in our study. In addition, the number of teenage pregnancies among girls under 15 years old is so small in Finland that it did not change the results (729 induced abortions and 54 childbirths among girls under 15 years old across the follow-up period).

3. Regarding table 1: In Table 1, if I understood correctly, the socioeconomic factors seem to be portrayed dichotomously (e.g. percentage of inhabitants having a high education level), although in the method section, it is reported that the data were treated as continuous variables in the calculations. It might be more comprehensible for the reader that the authors also provide the means of the continuous data in table 1.

R: Thank you for this comment. The socioeconomic variables are considered to be continuous variables in Table 1 and throughout the analysis. Although they are given as percentages (and represent the proportion of inhabitants that have or do not have a socioeconomic characteristic), our data are not at the individual level, but at the municipality level. Therefore, the variable is not a dichotomous variable. The socioeconomic variables within the dataset contain percentages representing different municipalities at different years, and are thus continuous variables. In the analysis, we assessed the effect of each variable to the change in teenage birth and induced abortion rates by using comparisons appropriate for each variable. For socioeconomic variables (i.e. the percentage of citizens with high education level and percentage of adults receiving social assistance) the rate ratios present the change in abortion and birth rates in relation to each percent unit increase in high education level or social assistance (Methods section p. 9, last paragraph).

Table 1 presents the mean percentage and the corresponding standard deviation across municipalities and years.

4. Regarding the limitations: The longitudinal retrospective register design of the study seems very comprehensive, but data on socioeconomic status per municipality do not indicate the socioeconomic status of the individual. The authors might state this also as a limitation.

R: Thank you for pointing this out. All of the data are at the municipality level. We have now stated this as a limitation. In our study setting, however, it is not possible to use the socioeconomic status of the individuals since the adolescents experiencing pregnancies at the end of the follow-up are still teenagers. (p.14, second paragraph).

5. Regarding the discussion: The rate of teenage pregnancy and induced abortions declines steeply in all 5 regions in Finland. Have the authors considered to employ some structural equation or path models to investigate, whether an increase in counseling or free-of-charge contraception or an amelioration of education level is associated with a later decrease? Additionally, it might be interesting

for the reader to elaborate a bit more on the possible reasons for this decrease, e.g., unconsidered factors.

R: Thank you for this comment. Regarding the suggestion of using structural equation modelling (SEM) or path analysis, such approaches are often applied when there is interest in investigating and modelling the relationships between all of the explanatory variables, created latent variables (constructed using the explanatory variables) and the outcomes of interest. This is often on a large dataset with numerous variables. However, such an approach is unnecessary in our study setting, given the ultimate objective of investigating the associations between the explanatory variables and the outcomes of interest. Furthermore, SEM has its own challenges (deciding upon latent variables, addressing the dependence structure, accounting for the rate nature of the outcome, etc.), and increases model complexity greatly, resulting in the interpretability of the results suffer. Path analysis itself is a simpler form of structural equation modelling, but is quite similar to regression methods (as used in the study). In addition, path analysis places greater emphasis on investigating causality, while with this observational study we aim to identify associations between socioeconomic factors, contraceptive services and teenage pregnancy.

Thus, a Poisson mixed effects model approach seems to be the better approach to analyzing this data given the study objectives and nature of the data. We are able to identify associations between the outcomes and the variables of interest, and we do observe such associations in the rate ratios obtained.

Minor points:

1. Discussion section, p. 15 of 21, l. 47: A “the” seems to be missing before “majority of the adolescent pregnancies...”.
2. Discussion section, p. 15 of 21, l. 40: A “the” seems to be missing before “100 largest municipalities in Finland...”.
3. Discussion section, p. 15 of 21, l. 51: An “as” seems to be missing before “unplanned or ambitious.”.

R: Thank you for pointing these out. We have revised the text accordingly.

VERSION 2 – REVIEW

REVIEWER	Brigitte Dahmen, M.D. University hospital RWTH Aachen, Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, Germany
REVIEW RETURNED	02-Jan-2021
GENERAL COMMENTS	Thank you very much. All my concerns were addressed adequately and I recommend the manuscript for publication in BMJopen.